

**REMARKS**

Claims 1, 4-8, and 10-12 are pending in this application. By the Office Action, claims 13 and 14 are withdrawn from consideration; the specification is objected to; claims 1 and 3-12 are objected to; claims 1 and 3-12 are rejected under 35 U.S.C. §112; and claims 1 and 3-12 are rejected under 35 U.S.C. §103. By this Amendment, the specification is amended; claims 1 and 7 are amended; and claims 3, 9, and 13-14 are canceled. Support for the amendments to claims 1 and 7 can be found in the specification as filed. No new matter is added.

Entry of this Amendment is proper under 37 C.F.R. §1.116 because the Amendment places the application in condition for allowance (for the reasons discussed herein) or places the application into better form for Appeal should an Appeal be necessary. The Amendment does not present any additional claims without canceling a corresponding number of finally rejected claims, does not raise the issue of new matter, and does not raise any new issues requiring additional search and/or consideration since the Amendment is directed to subject matter previously considered during prosecution. Furthermore, the amendments are necessary and were not earlier presented because they are in response to issues raised in the Final Rejection. Applicants respectfully request entry of the Amendment.

I. **Objection to Specification**

The specification is objected to for informalities. By this Amendment, the specification is amended to correct the informalities noted by the Examiner. Reconsideration and withdrawal of the objection are respectfully requested.

II. **Objection to Claims**

Claims 1 and 3-12 are objected to for informalities. By this Amendment, the claims are amended to correct the informalities noted by the Examiner. Reconsideration and withdrawal of the objection are respectfully requested.

III. Rejection Under §112

Claims 1 and 3-12 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The Office Action continues to assert that the meaning of the term "apodization exposure" is unclear, and states that it is understood that the term refers to an intended use of the claimed phase mask. Applicants respectfully traverse the rejection.

Claim 1, for example, recites that the duty ratios for the grooves are selected so that the phase mask can be used to perform an apodization exposure of the object when the object is exposed to the UV light through the phase mask. Although the recited apodization exposure relates to a use of the claimed phase mask, clearly the term also limits the claimed invention. That is, the claim recites that the duty ratios for the grooves are specifically selected so that the phase mask can be used to perform an apodization exposure of the object. If the duty ratios for the grooves are not appropriately selected, then the phase mask will be different and cannot be used to perform an apodization exposure of the object.

Based on the description in the specification and the understanding in the art, the claims are not indefinite. Reconsideration and withdrawal of the rejection are respectfully requested.

IV. Rejections Under §103

A. Claims 1, 4-8 and 10-12 Over Segawa and Inoue

Claims 1, 4-8, and 10-12 are rejected under 35 U.S.C. §103(a) over Segawa in view of Inoue. Applicants respectfully traverse the rejection.

Claim 1 is directed to a phase mask for forming a diffraction grating in an object for an optical medium by exposing the object to UV light containing diffracted light rays through the phase mask to cause a refractive index of a photosensitive part of the object to change by interference fringes produced by interference of diffracted light rays of different orders of diffraction, the phase mask comprising: a transparent substrate having a surface provided

with a pattern of a plurality of grooves, the pattern being entirely transparent; wherein each of the grooves has a duty ratio dependent on a position of the respective groove on the substrate; the duty ratios for the grooves are selected so that the phase mask can be used to perform an apodization exposure of the object when the object is exposed to the UV light through the phase mask; and the plurality of grooves are arranged on the substrate in a single pitch, the duty ratios being determined by varied widths of the grooves. Independent claim 7 is directed to a method of fabricating such a phase mask. Such a phase mask, and method of making a phase mask, would not have been obvious over the cited references.

The Office Action asserts that Segawa discloses all of the limitations of the claimed invention, except for a single constant pitch for the phase mask. The Office Action argues that Segawa teaches a phase mask including a substrate having grooves formed with a groove pitch varying between 0.85 and 1.25  $\mu\text{m}$ . The Office Action further asserts that Segawa discloses varying a duty ratio of the grooves by varying widths and depths of the grooves according to their respective positions. The Office Action admits that Segawa does not teach that the plurality of grooves are arranged on the substrate in a single pitch, the duty ratios being determined by varied widths of the grooves. However, the Office Action argues that such a single constant pitch for the phase mask is taught by Inoue. Notwithstanding these assertions, Segawa and Inoue would not have rendered obvious the phase mask and method of claims 1 and 7.

In each of claims 1 and 7, a phase mask includes grooves arranged on a substrate in a single pitch, or a phase mask is prepared by forming grooves on a substrate in a single pitch. In claims 1 and 7, the widths of grooves vary depending on the position of the grooves. In Segawa, by contrast, a groove pitch is varied depending on the position of the grooves. *See* column 3, lines 1 to 5. There is no teaching or suggestion in Segawa that grooves should be arranged on a substrate in a single pitch. Also, there is no teaching or suggestion in Segawa

of varying the width of the grooves depending on the position of the grooves. Rather, it appears that the grooves of the phase mask of Segawa vary in pitch and are constant in width and depth.

Moreover, according to claims 1 and 7, the pattern having a plurality of grooves is entirely transparent. This feature is also not taught or suggested by Segawa. In Segawa, the pattern layer is formed from a chromium thin film. See Segawa at col. 7, lines 45-52. Likewise, in Inoue, the pattern layer is also formed from a chromium thin film. See Inoue at col. 9, lines 28-34. However, these chromium layers of Segawa and Inoue are not transparent pattern layers, as claimed.

Nowhere does either Segawa or Inoue teach or suggest that the pattern having a plurality of grooves is entirely transparent. Any combination of Segawa and Inoue would have provided a phase mask where the pattern layer is formed of chromium, which is not transparent. Neither reference teaches or suggests that the chromium layer could or should be replaced by a transparent layer.

For at least these reasons, claims 1 and 7 would not have been rendered obvious by Segawa in view of Inoue. Claims 4-6, 8 and 10-12 depend variously from claims 1 and 7 and, thus, also would not have been rendered obvious by Segawa in view of Inoue. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

B. Claims 3 and 9 Over Segawa and Miyamae

Claims 3 and 9 are rejected under 35 U.S.C. §103(a) over Segawa in view of Miyamae. Although Applicants do not necessarily agree with the rejection, in the interest of advancing prosecution claims 3 and 9 are canceled herein. Accordingly, the rejection is moot and should be withdrawn. Reconsideration and withdrawal of the rejection are respectfully requested.

C. Claims 1, 4-8 and 10-12 Over Kurihara, Maisenhoelder, and Inoue

Claims 1, 4-8, and 10-12 are rejected under 35 U.S.C. §103(a) over Kurihara in view of Maisenhoelder and further in view of Inoue. Applicants respectfully traverse the rejection.

Independent claims 1 and 7 are set forth above. As with Segawa and Inoue, above, any combination of Kurihara and Maisenhoelder with Inoue also do not teach or suggest the claimed phase mask or method.

The Office Action asserts that Kurihara discloses a phase mask including a substrate having grooves formed with a groove pitch of between 0.85 and 1.25  $\mu\text{m}$ . The Office Action concedes that Kurihara does not disclose varying a duty ratio of the grooves by varying widths and depths of the grooves according to their respective positions. However, the Office Action asserts that it would have been obvious to vary a duty ratio of the grooves by varying widths and depths of the grooves according to their respective positions in view of the teachings of Maisenhoelder. Further, the Office Action admits that Kurihara and Maisenhoelder do not teach that the plurality of grooves are arranged on the substrate in a single pitch, the duty ratios being determined by varied widths of the grooves. However, the Office Action argues that such a single constant pitch for the phase mask is taught by Inoue. Notwithstanding these assertions, Kurihara, Maisenhoelder, and Inoue do not teach or suggest the phase mask and method of claims 1 and 7.

As indicated above, in each of claims 1 and 7, a phase mask includes grooves arranged on a substrate in a single pitch, or a phase mask is prepared by forming grooves on a substrate in a single pitch. In claims 1 and 7, the widths of grooves vary depending on the position of the grooves. Kurihara provides no disclosure regarding whether the grooves of the disclosed phase mask should have a constant or varying pitch, or whether the grooves should have constant or varying widths depending on position or any other parameter. Rather

Kurihara merely discloses that grooves may be arranged with a pitch of between 0.85 and 1.25  $\mu\text{m}$ . *See, e.g.*, paragraph [0017].

The Office Action correctly points out that Maisenhoelder discloses that a grating adjustment can be performed by changing the groove-to-land ratio and the grating depth of a phase mask. *See* paragraph [0172]. However, Maisenhoelder, like Kurihara, does not teach or suggest (a) that either the groove-to-land ratio or the grating depth can be changed while maintaining a single pitch, or (b) that the width of the grooves should vary depending on the position of the grooves. The only teaching or suggestion of forming grooves of a phase mask in such a manner is found in the instant specification. Of course, to rely on such teaching or suggestion would constitute impermissible hindsight.

Moreover, according to claims 1 and 7, the pattern having a plurality of grooves is entirely transparent. This feature is also not taught or suggested by Kurihara and Maisenhoelder. In Kurihara, the pattern layer is formed from a chromium thin film. *See* Kurihara at paragraph [0027]. In Maisenhoelder, the pattern layer is formed from a thin film of  $\text{Ta}_2\text{O}_5$ ,  $\text{Nb}_2\text{O}_5$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ -- $\text{TiO}_2$ ,  $\text{HfD}_2$ ,  $\text{Y}_2\text{O}_3$ ,  $\text{SiONy}$ ,  $\text{Si}_3\text{N}_4$ ,  $\text{HfOxNy}$ ,  $\text{AlOxNy}$ ,  $\text{TiOxNy}$ ,  $\text{MgF}_2$  or  $\text{CaF}_2$ . *See* Maisenhoelder at paragraph [0050]. Likewise, in Inoue, the pattern layer is also formed from a chromium thin film. *See* Inoue at col. 9, lines 28-34. However, these layers of Kurihara, Maisenhoelder, and Inoue are not transparent pattern layers, as claimed.

Nowhere does any of Kurihara, Maisenhoelder, or Inoue teach or suggest that the pattern having a plurality of grooves is entirely transparent. Any combination of Kurihara and Maisenhoelder and Inoue would have provided a phase mask where the pattern layer is formed of chromium, as in Kurihara or Inoue, or the specific materials of Maisenhoelder, which materials are not transparent. None of the references teach or suggest that the chromium or other layers could or should be replaced by a transparent layer, as claimed.

For at least these reasons, claims 1 and 7 would not have been rendered obvious by Kurihara and Maisenhoelder in view of Inoue. Claims 4-6, 8 and 10-12 depend variously from claims 1 and 7 and, thus, also would not have been rendered obvious by Kurihara and Maisenhoelder in view of Inoue. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

D. Claims 3 and 9 Over Kurihara, Maisenhoelder, and Miyamae

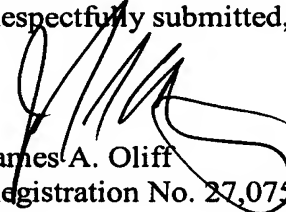
Claims 3 and 9 are rejected under 35 U.S.C. §103(a) over Kurihara in view of Maisenhoelder and further in view of Miyamae. Although Applicants do not necessarily agree with the rejection, in the interest of advancing prosecution claims 3 and 9 are canceled herein. Accordingly, the rejection is moot and should be withdrawn. Reconsideration and withdrawal of the rejection are respectfully requested.

V. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

  
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